Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules to Promote Aviation Safety	)	WT Docket No. 19-140
	)	
	)	

COMMENTS OF THE WIMAX FORUM

Sean T. Conway, Esq.
Mark A. Settle, P.E.

Wilkinson Barker Knauer, LLP
1800 M Street, NW
Suite 800N
Washington, DC 20036
202.783.4141

Counsel to The WiMAX Forum

September 3, 2019

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EXECUTIVE SUMMARY

The Federal Communications Commission ("FCC" or "Commission") should pursue a flexible, light-touch regulatory approach for Aeronautical Mobile Airport Communication Systems, better known as AeroMACS.

The adoption of AeroMACS by the global aviation community reflects a need to establish a framework for new 21st Century airport surface communications designed to advance the safety and regularity of flight. In the two and a half years since the WiMAX Forum petitioned the Commission for service rules, momentum for AeroMACS continues to grow in the United States and around the globe. New trials and deployments are being planned and launched at an increasing frequency, and stakeholders are making plans for the widespread deployment of this technology. Through these trials, deployments, and other ongoing work, the Federal Aviation Administration ("FAA") has identified over 330 applications for AeroMACS.

The Commission should utilize a Channel Manager to manage usage of AeroMACS channels by non-Federal users. A Channel Manager will help to maximize efficient and flexible usage of this spectrum at each airport. In addition, if utilized in combination with complementary eligibility, licensing, and coordination rules, a single, nationwide Channel Manager can prevent hoarding or warehousing of spectrum, ensure nationwide consistency for accessing AeroMACS channels, simplify the utilization of AeroMACS frequencies for non-Federal AeroMACS users, and facilitate coordination with other users of the band.

In contrast to the use of a Channel Manager to manage AeroMACS channels, the proposed licensing requirements would impose onerous and unnecessary costs on users, likely constraining the deployment of AeroMACS systems and chilling experimentation and innovation in new applications. Moreover, this proposal would not further the Commission's underlying policy objective. The FCC instead should pursue a more flexible licensed-by-rule approach while empowering the Channel Manager to serve as the central source of AeroMACS usage.

Similarly, the restrictive eligibility rules proposed by the Commission potentially would preclude certain intended beneficiaries of AeroMACS networks from enjoying the benefits of this service, are contrary to the Commission's historic aversion to gatekeepers of communications networks, and could potentially dampen investment in AeroMACS system. The Commission instead should adopt a more permissive licensed-by-rule approach. Such an approach is more likely to result in robust use of AeroMACS communications for the purpose of promoting safety and regularity of flight.

Finally, greater reliance on the Channel Manager will enable more efficient coordination with other authorized users of the band. This is particularly so with respect to Federal/non-Federal AeroMACS coordination. Such coordination should take place between Federal and non-Federal users in accordance with a Memorandum of Agreement ("MOA") to be negotiated: 1) on behalf of Federal users by the FAA; and 2) on behalf of non-Federal users by the single, nationwide Channel Manager. Coordination pursuant to such an MOA likely will maximize use of the AeroMACS channels, help speed deployments, and make more efficient use of federal resources.

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The WiMAX Forum ("WiMAX Forum" or "Forum"), by its attorneys, submits these comments to the *Notice of Proposed Rulemaking* in this proceeding proposing service rules for the Aeronautical Mobile Airports Communications System, better known as AeroMACS.[1]

In response to increasing demand for high-bandwidth services, the momentum for AeroMACS continues to grow in the United States and around the globe. New trials and deployments are being planned and launched at an increasing frequency, and AeroMACS stakeholders are making plans for the widespread deployment of this technology. The WiMAX Forum thus applauds the decision to move forward with a proceeding examining service rules for this emerging technology and outlines herein specific steps the Federal Communications Commission ("FCC" or "Commission") can take to implement a flexible, light-touch regulatory regime facilitating the widespread deployment of AeroMACS at America's airports for communications related to safety and regularity of flight.

[1] *Amendment of the Commission's Rules to Promote Aviation Safety*, Notice of Proposed Rulemaking, FCC 19-53 (rel. June 7, 2019) ("*Notice*").

I. INTRODUCTION

The WiMAX Forum is a not-for-profit industry association that certifies and promotes the compatibility and interoperability of broadband wireless products based upon the IEEE Standard 802.16. Its members include companies from the telecommunications, aviation and equipment manufacturing industries, among others.[2] In response to the global aviation industry's decision to employ the IEEE Standard 802.16 as the technology of choice for airport surface communications applications, the WiMAX Forum chartered its Aviation Working Group in 2012. Since the creation of this group, the Forum has played a leading role in advancing the development, testing, and deployment of this vital new communications service.[3] Today, the WiMAX Forum is the only equipment certification body for AeroMACS products recognized by the Federal Aviation Administration ("FAA").[4]

AeroMACS is the result of a global initiative to develop a next generation surface communications system to accommodate increased aircraft and airport traffic. The potential services and applications provided by AeroMACS can be grouped into three major categories: Air Traffic Control and Air Traffic Management and infrastructure; airline operations; and

[2] *See* WiMAX Forum, Member Companies, http://wimaxforum.org/Company/Directory (last visited Aug. 29, 2019).

[3] *See* Letter from Claude Pichavant, Senior Expert Communications & Surveillance, Airbus Operations S.A.S., to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 17, 2017) (submitted for filing as Pichavant) ("Finally, Airbus wishes to express its deepest appreciation to the WiMAX Forum for its continued leadership in AeroMACS on a worldwide level."); *see also* Letter from Eugene Crozier, Powertech Labs Inc., to Marlene H. Dortch, Secretary, FCC, RM-11793, at 2 (filed Aug. 15, 2017); Letter from Michel Jabbour, Business Segment Manager CI, Siemens Industry, to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 16, 2017); Letter from Brian Crowe, Talus Atomics Corporation, to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 16, 2017); Letter from Mark Altshuller, CTO, Telrad Networks Ltd., to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 17, 2017); Letter from Geoffrey Noakes, VP, Business Development, Symantec Corporation, to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 17, 2017); Letter from Oscar G. Marcia, Chief Executive Officer, Eonti Inc., to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 17, 2017); Letter from Frank O'Connor, Chief Executive Officer, Airtel Inc., to Marlene H. Dortch, Secretary, FCC, RM-11793, at 3 (filed Aug. 18, 2017).

[4] FAA, *Purchase of AeroMACS Technology equipment for field trial*, Request for Qualifications – SIR (DTFACT-16-R-00071) (Aug. 27, 2016), https://faaco.faa.gov/index.cfm/announcement/view/25330.

airport and/or port authority operations. While the first is a Federal Government initiative, the latter two will take place under the FCC's jurisdiction.

Key civil aviation authorities recognize the importance of this technology for mobile and fixed broadband communications relating to safety and regularity of flight. The International Civil Aviation Organization ("ICAO") recommends AeroMACS for coping with increased volumes of data exchange at busy airport surfaces.[5] And AeroMACS is a core technology outlined in the Future Communication Infrastructure framework, which harmonizes the future aeronautical communications capabilities intended to support the shared vision of FAA's Next Generation Air Transportation System in the U.S. and the Single European Sky ATM Research ("SESAR") in Europe.[6]

The International Telecommunications Union ("ITU") laid the groundwork for the global harmonization of AeroMACS operations more than a decade ago when it added an aeronautical mobile (route) service allocation for the 5091-5150 MHz band on an international basis at the World Radio Conference 2007 ("WRC-07").[7] The Commission subsequently allocated the

[5] *See* EUROCONTROL, Aeronautical mobile airport communications system datalink (AeroMACS), https://www.eurocontrol.int/system/aeronautical-mobile-airport-communications-system-datalink (last visited Aug. 22, 2019). In addition, ICAO's Global Air Navigation Plan (GANP) outlines recommendations to deploy AeroMACS systems at large- and medium-sized hub airports worldwide. *See* ICAO, *2013-2028 Global Air Navigation Plan* (2013), https://www.icao.int/publications/Documents/-9750_4ed_en.pdf.

[6] *See* WiMAX Forum, *Worldwide AeroMACS Implementations Prove Their Tremendous Potential* (Nov. 19, 2015), http://www.wimaxforum.org/Page/News/PR/20151119_Worldwide_AeroMACS_Implementations_Prove_Their_Tremendous_Potential; James M. Budinger & Edward Hall, *Aeronautical Mobile Airport Communications System (AeroMACS)*, NASA (Oct. 2011), https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20110022433.pdf.

[7] ITU-R M.1827, *Guideline on technical and operational requirements for stations of the aeronautical mobile (R) service (AM(R)S) limited to surface application at airports and for stations of the aeronautical mobile service (AMS) limited to aeronautical security (AS) applications in the 5091-5150 MHz*, ITU (2007), https://www.itu.int-/dms_pubrec/itu-r/rec/m/R-REC-M.1827-0-200710-S!!PDF-E.pdf, (superseded, ITU-R M.1827-1, *Guideline on technical and operational requirements for stations of the aeronautical mobile (R) service limited to surface application at airports in the frequency band 5091-5150 MHz* (2015), https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.1827-1-201501-I!!PDF-E.pdf).

5091-5150 MHz band to AeroMACS in 2015[8] and the 5000-5030 MHz band to AeroMACS in 2017.[9] In making these decisions, the Commission cited ITU studies identifying a need of 130 MHz for AeroMACS applications.[10]

Shortly following the adoption of the *FCC 2017 R&O*, the WiMAX Forum filed its Petition proposing service rules for AeroMACS.[11] The Petition was the direct result of the Forum's proactive efforts to engage with the AeroMACS ecosystem, including the various civil aviation authorities, to advance the deployment of this technology.[12] Those efforts to build consensus among stakeholders informed the Petition's proposals, which focused on lowering barriers to entry, minimizing red tape, maximizing the efficient utilization of the spectrum, and allowing the marketplace and technological developments to determine the highest and best uses of this technology. As the Forum previously noted, its proactive, consensus-building efforts paid dividends by generating a record that was highly supportive of the proposed framework.[13]

Aspects of the *Notice* reflect proposals included in the WiMAX Forum's Petition. Most notable is the decision to seek comment on the use of a Channel Manager. The Channel Manager will help to maximize efficient and flexible usage of this spectrum at each airport. In

[8] *Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2007) (WRC-07), Other Allocation Issues, and Related Rule Updates*, Report and Order, Order, and Notice of Proposed Rulemaking, 30 FCC Rcd 4183, 4209 ¶ 58 (2015) ("*FCC 2015 Actions*"). The FCC also allocated the 5091-5150 MHz band to aeronautical mobile telemetry ("AMT") at 52 flight test areas, but with AeroMACS having a priority over AMT systems. *Id.* at 4209 ¶ 60.

[9] *Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012) (WRC-12), Other Allocation Issues, and Related Rule Updates*, Report and Order, 32 FCC Rcd 2703, 2718 ¶ 40 (2017) ("*FCC 2017 R&O*").

[10] *See, e.g.*, *FCC 2015 Actions*, 30 FCC Rcd at 4265 ¶ 230 (citing *CPM Report to WRC-12*, Chapter 1, Agenda Item 1.4, p. 35, at 1/1.4/3.4.1 (Spectrum requirements for surface applications at airports around 5 GHz)).

[11] Petition of WiMAX Forum for Rulemaking to Adopt AeroMACS Service Rules, RM-11793 (filed Mar. 31, 2017) ("Petition").

[12] *Id.* at 3.

[13] Reply Comments of WiMAX Forum, RM-11793, at 3, 11-14 (filed Sept. 5, 2017) ("Forum Reply Comments").

addition, if utilized in combination with complementary eligibility, licensing, and coordination rules, the Channel Manager can prevent hoarding or warehousing of spectrum, ensure nationwide consistency for accessing AeroMACS spectrum, simplify the utilization of AeroMACS frequencies for non-Federal AeroMACS users, and facilitate coordination with other users of the band, including Federal AeroMACS users, AMT users, and satellite users. The Forum thus applauds the Commission for seeking comment on this approach for managing channel usage.

At the same time, many proposals contained in the *Notice* would benefit from a more flexible, light-touch regulatory approach. First, the proposed licensing rules will impose onerous and unnecessary costs on AeroMACS users that risk artificially constraining the deployment of this technology. Greater reliance on the Channel Manager can accomplish the objectives the Commission seeks to achieve with these proposals and will do so at a fraction of the cost. Second, the proposed eligibility rules, which would effectively establish airports and airport operators as the gatekeepers for AeroMACS spectrum, needlessly risk limiting the universe of AeroMACS users. At best, such restrictive eligibility rules would create a patchwork system for other intended beneficiaries of AeroMACS, requiring entities to navigate access to channels on an airport-by-airport basis. And third, the proposed coordination rules risk artificially constraining the deployment of non-Federal AeroMACS systems. These proposals are at odds with the Commission's proven approach of providing maximum flexibility for emerging wireless services and the Commission's previous decisions related to this band. The Commission therefore should decline to adopt these proposals and instead pursue final rules as described below.

II. DEMAND FOR AEROMACS CONTINUES TO GROW, FUELING THE MOMENTUM FOR THIS TECHNOLOGY BOTH DOMESTICALLY AND INTERNATIONALLY

In the Petition and its 2017 Reply Comments, the WiMAX Forum described the growing momentum for AeroMACS both in the United States and around the world.[14] On the domestic front, this momentum was reflected in FAA-sponsored trials and deployments at the Glenn Research Center Testbed located on the Cleveland Hopkins International Airport, San Francisco International Airport, Otis Air Force Base, and Syracuse Hancock International Airport, among others. Internationally, the momentum for AeroMACS was arguably more pronounced. Three Chinese airlines were already using AeroMACS in the cockpit, and trials and deployments had occurred or were underway at airports in Asia, Europe, and South America.

As demand for AeroMACS continues to grow, the momentum for this emerging technology continues to increase dramatically. Since 2017, FAA-sponsored trials and deployments have been conducted or are ongoing at Dallas/Fort Worth International Airport, Portland International Airport, Louis Armstrong New Orleans International Airport, Pittsburgh International Airport, Atlantic City Airport, and Ted Steven Anchorage International Airport. Through these trials, deployments, and other ongoing work, the FAA has identified over 330 applications for AeroMACS.[15] Moreover, nine U.S. airports are planning or already using this technology to support the FAA's Airport Surface Surveillance Capability program, which helps to prevent runway collisions.

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[14] Petition at 3-10 (discussing the demand for AeroMACS and trials and deployments of AeroMACS both in the U.S. and internationally).

[15] *See, e.g.*, Federal Aviation Administration, *Aeronautical Mobile Airport Communications System (AeroMACS) for Access to SWIM*, at 7-11 (Nov. 3, 2010), https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/atc_comms_services/swim/documentation/media/demo_tim_6/10_TIM6%20AeroMACS%20Budinger%20Rev1%2003-Nov-2010.pdf (noting that over 330 applications have been identified).

Interest in AeroMACS is increasing abroad as well. This momentum is most apparent in China, where 21 airports already have constructed AeroMACS networks, with many more airports expected to come online in the coming years.[16] This momentum is fueled in part by a desire to increase on-time flight performance at these airports. Indeed, trials in China's Chengdu airport found that air traffic control procedures using AeroMACS reduced clearance delivery times by twenty minutes per flight.[17] Moreover, four Chinese airlines – Air China, China Eastern Airline, Hainan Airline, and Shandong Airline – recently participated in the D-TAXI system cockpit trial, successfully demonstrating how AeroMACS can provide pilots with real-time situational awareness of all other aircrafts in their environment to enhance safety and efficiency.[18] And of course, trials and deployments have been conducted recently or are ongoing in other regions of the world, including at Rio de Janeiro–Antonio Carlos Jobim International Airport (Brazil), Tokyo International Airport (Japan), and Lisbon Portela Airport (Portugal). At the Rio de Janeiro deployment, for example, AeroMACS is being used to monitor the runway for water levels, helping to guard against potentially catastrophic instances of hydroplaning during take-off or landing.[19]

In addition to these trials and deployments, aviation stakeholders continue to prepare for the imminent widespread deployment of AeroMACS. Most notably, the WiMAX Forum and

[16] *See* WiMAX Forum, *AeroMACS Advanced Worldwide as the Standardized Solution for the Airport Surface* (Dec. 20, 2017), http://wimaxforum.org/Page/News/PR/20171220_AeroMACS_Advances_Worldwide_as_the_-Standardized_Solution_for_the_Airport_Surface (noting that China's Aviation Data Communication Corporation has been authorized to install AeroMACS in 110 airports).

[17] *See*, Aloke Roy, *AeroMACS: It's like a Real-time GPS, but Better!*, Honeywell (May 23, 2016), https://aerospace.honeywell.com/en/blogs/2016/may/aeromacs-it-is-like-a-real-time-gps-but-better.

[18] ICAO, Thirteenth Air Navigation Conference Montreal Canada, *AeroMACS Development in China* (Oct. 2018), https://www.icao.int/Meetings/anconf13/Documents/WP/wp_198_en.pdf.

[19] *See* WiMAX Forum, *Siemens Deploys Innovative Communication System at Tom Jobim Airport in Brazil* (Aug. 7, 2019), http://wimaxforum.org/Page/News/PR/20190807_Siemens_Deploys_Innovative_Communication_System-_at_Tom_Jobim_Airport.

ICAO recently formed an alliance to provide oversight to the AeroMACS Public Key Infrastructure ("PKI") program activities.[20] This alliance will help provide strategic guidance to stakeholders to ensure AeroMACS communications remain secure.

Avionics industry stakeholders also continue to press forward with plans for the deployment of AeroMACS in the near future. Siemens USA, for instance, achieved an important milestone earlier this year when it successfully completed both Protocol Conformance Testing and Radio Conformance Testing certification phases for its AeroMACS products. In announcing these milestones, Siemens USA reiterated its commitment "to supporting the roll out of AeroMACS technology to support enhanced safety and regularity of flight operations."[21]

AeroMACS is gaining momentum at a pace greater than ever before. New trials and deployments are being planned and launched both in the United States and around the world, and stakeholders continue to prepare for the widespread deployment of this technology. To sustain this momentum, the Commission must expeditiously adopt final rules that provide AeroMACS stakeholders the certainty and flexibility needed to deploy this potentially lifesaving technology.

III. A FLEXIBLE, LIGHT TOUCH-REGUALTORY APPROACH WILL FACILITATE THE DEPLOYMENT OF AEROMACS SYSTEMS AND DEVELOPMENT OF NEW AND INNOVATIVE APPLICATIONS THAT WILL IMPROVE SAFETY AND ON-TIME FLIGHT PERFORMANCE

As AeroMACS continues to develop, the Commission should pursue a flexible, light-touch regulatory approach for this service. While the momentum for AeroMACS is undeniable, many of the applications that will use this technology continue to evolve. Accordingly, the

[20] *See* WiMAX Forum, *The WiMAX Forum Forms Alliance with ICAO to Deliver Secure Networks*, (Dec. 12, 2017), http://wimaxforum.org/Page/News/PR/20171212_The_WiMAX_Forum_Forms_Alliance_with_ICAO_to_Deliver_Secure_Networks.

[21] *See* WiMAX Forum, *Siemens Achieves Important Milestone to Support AeroMACS Development* (Apr. 8, 2019), http://wimaxforum.org/Page/News/PR/20190408_Siemens_Achieves_Important_Milestone_to_Support_AeroMACS_Development.

extent of AeroMACS usage will progress over time, expanding how much spectrum the totality of the various emerging AeroMACS applications will require, and the universe of users that will derive benefit from this technology. Rather than trying to predict these factors without sufficient real-world experience, the Commission should exercise regulatory humility and avoid adopting overly specific and prescriptive rules. By lowering barriers to entry, minimizing red tape, and allowing the marketplace and technological developments to determine the highest and best uses of this technology, the Commission will maximize the public interest benefits of the AeroMACS service.

Many of elements of the *Notice* reflect a desire to pursue flexible, light-touch policies. Most notably, the *Notice* seeks comment on the use of a Channel Manager, which will help to maximize efficient and flexible usage of this spectrum at each airport.[22] At the same time, certain proposals contained in the *Notice* would benefit from more flexibility. For example, the proposed licensing rules will impose onerous and unnecessary costs on AeroMACS users that risk artificially constraining the deployment of this technology.[23] Similarly, the proposed eligibility rules, which would effectively establish airports and airport operators as the gatekeepers for AeroMACS spectrum, needlessly risk limiting the universe of AeroMACS users.[24] These proposals are at odds with the Commission's proven approach of providing maximum flexibility for emerging wireless services.

The licensing and eligibility proposals are modelled largely on legacy "command and control" spectrum management processes traditionally used for aviation and other safety related services, but inapplicable to AeroMACS. While such approaches typically enhance safety for

[22] *See Notice* ¶ 40.

[23] *See id.* ¶ 37.

[24] *See id.* ¶ 38.

aviation service operators, in this instance such a measured response would hamper users from realizing many of the benefits for which AeroMACS was designed. AeroMACS was created to be agile and responsive to the many and varying needs of each unique airport. Thus, as more fully explained below, reliance on a Channel Manager can help allocate network capacity on a near real-time basis amongst disparate users at any given airport. This allows short-term communication requirements to be met by avoiding situations in which users seek a license for more spectrum than is typically necessary in anticipation of greater bandwidth needs on an occasional basis. Consequently, a strict location-based frequency licensing regime and restrictive eligibility rules do not afford the flexibility required to maximize the public interest benefits of AeroMACS channels. The Forum thus urges the Commission to adopt a licensed-by-rule approach and a more flexible eligibility framework as described further below.

A. Utilization of a Single, Nationwide Channel Manager Will Help to Maximize Efficiency, Consistency, and Effectiveness of the Use of AeroMACS Channels

As discussed in the Petition and the Forum's Reply Comments, the Forum's proposal for use of a single, nationwide Channel Manager is designed to maximize the efficient, flexible, and effective usage of AeroMACS channels.[25] This approach – in combination with complementary licensing, eligibility, and coordination rules – will yield numerous benefits for the AeroMACS ecosystem.

First, the Channel Manager will maximize efficient and flexible usage of this spectrum to meet the unique needs of each location.[26] The flexibility inherent in this approach reflects that AeroMACS users at a major hub like Dallas/Fort Worth International Airport likely will have

[25] *See* Petition at 19-23; Forum Reply Comments at 12-14.

[26] Moreover, this approach will prevent warehousing and hoarding of spectrum when combined with flexible eligibility rules.

very different needs from those of users at a smaller regional field like Ithaca Tompkins Regional Airport. Because of the different use cases that are likely to be present at different airports, the Channel Manager will have the flexibility to employ the full range of available sharing techniques based on the needs of each location, but in each case with the goal of achieving fair and equitable sharing that results in the most efficient use of the spectrum.[27]

Second, the Channel Manager approach will ensure nationwide consistency for accessing AeroMACS spectrum. End users of the spectrum would not have to dedicate the time and resources to deal with different allocation and interference procedures at each airport, but instead would have one single, nationwide non-Federal Channel Manager whose responsibility would be to minimize the burden on AeroMACS users.

And third, the use of a single, nationwide Channel Manager will simplify the utilization of AeroMACS frequencies for non-Federal AeroMACS users. Rather than deal with multiple Channel Managers nationwide, non-Federal AeroMACS users will have one entity with whom they will interact. This will streamline AeroMACS registration by non-Federal users, especially airlines, because there will be one single point of contact for all airports.

There is precedent for such an approach. The FCC designated a single nationwide database manager/coordinator for both the Wireless Medical Telemetry Service ("WMTS") and

[27] For example, at Ithaca, reduced demand may allow the Channel Manager to assign full time use of channels to interested users. At Dallas/Fort Worth, however, it may be necessary for the Channel Manager to provide for a given channel to be shared. That could be accomplished by limiting a given user's operations to a particular area of the airport (for example, limiting an airline's use of a particular channel to its hanger area). Or, the Channel Manager could limit use to particular times (for example, an international airline that serves an airport with just a few flights each week might be limited to windows around the arrival and departure of the aircraft). The important point is that the Channel Manager will have the flexibility to make rational decisions on a case-by-case basis, guided by the needs of its constituents. The WiMAX Forum has proposed that the Channel Manager be guided in its activities by an advisor group of interested aviation industry stakeholders, which will assure that the sharing mechanisms employed by the Channel Manager are fair and efficient. *See* Petition at 22-23.

Medical Body Area Network ("MBAN") services.[28] Similar to AeroMACS, both WMTS and MBAN services involve mobile deployments, and a large proportion of users who are not traditional FCC regulatees.

To maximize the benefits of the Channel Manager, the Commission's rules must allow the Channel Manager to react flexibly to marketplace and technological developments. The Commission should thus adopt rules that do not specify how the Channel Manager is to assign channels to eligible users, whether any types of entities should be granted priority or preference in channel assignments, whether channels can be shared by different entities, the duration of channel assignments, build-out requirements, or any similar provisions. At this early stage of AeroMACS evolution, it would not be prudent to adopt overly specific and prescriptive rules.[29]

Moreover, given the growing momentum for AeroMACS, the Commission should not let the selection of a Channel Manager unduly delay the availability of this service. The Commission thus should initiate the selection process of a Channel Manager simultaneously with the adoption of final service rules. Doing so will help to ensure the availability of AeroMACS on an expeditious timeline.

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[28] *See Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service*, Report and Order, 15 FCC Rcd 11206, 11216 ¶ 28 (2000); *Amendment of the Commission's Rules to Provide Spectrum for the Operation of Medical Body Area Networks*, First Report and Order and Further Notice of Proposed Rulemaking, 27 FCC Rcd 6422, 6437 ¶ 29 (2012).

[29] Of course, the Channel Manager would not have unbridled discretion. As suggested in the Petition, the Commission could require that the winning applicant establish an advisory board that ensures industry input regarding its key activities, including the setting of fees, establishment of sharing processes, and other key operating principles. This advisory board might include representatives from the likely AeroMACS user community (including both aircraft operators and airport operators or their representative trade associations), service providers, and manufacturers. *See* Petition at 22. Additionally, the Petition proposes that the Channel Manager make its services available to eligible non-Federal users nationwide on a non-discriminatory basis and be authorized to charge users on a non-discriminatory basis certain reasonable fees limited to the Channel Manager's costs. *See id.* at 21-22. And, the FCC always retains authority to revisit the AeroMACS rules and respond either to user concerns or marketplace developments should unanticipated problems arise.

B. A Licensed-By-Rule Approach Will Minimize Regulatory Procedures and Costs While Achieving the Commission's Policy Objectives

In contrast to the use of a Channel Manager to efficiently manage AeroMACS channels, the *Notice*'s proposed licensing requirements do not reflect a light-touch regulatory approach.[30] Rather, these proposals would impose onerous and unnecessary costs on users, likely constraining the deployment of AeroMACS systems and chilling experimentation and innovation in development of new applications. Moreover, this licensing proposal would not further the Commission's underlying policy objective. The Commission instead should pursue a more flexible licensed-by-rule approach while empowering the Channel Manager to serve as the central source of AeroMACS usage.

In its Petition, the Forum proposed a licensed-by-rule approach for non-Federal AeroMACS users, whereby an eligible entity would be authorized under Part 95 to operate AeroMACS stations without an individual license issued by the FCC.[31] The *Notice*, however, proposes to require the licensing of fixed and base station transmitters by geographic coordinates and the licensing of mobile units in an area of operations defined by geographic point-radius.[32] According to the *Notice*, these licensing proposals are motivated by a desire to ensure the Commission is able to quickly identify licensees in the band, especially in cases of interference to critical safety-related air traffic control applications.[33]

A licensed-by-rule approach is more administratively efficient and thus will best facilitate deployment of AeroMACS systems and continued innovation and experimentation in AeroMACS usage. Under the proposed rule, non-Federal AeroMACS users would need to

[30] *See Notice* ¶ 37.

[31] *See* Petition at 17.

[32] *Notice* ¶ 37.

[33] *Id.*

provide *both* the Commission and the Channel Manager with detailed information about their system deployments. By comparison, under a licensed-by-rule approach, non-Federal AeroMACS users would need to submit such information once—to the Channel Manager.

Chairman Pai repeatedly has stressed the importance of cutting red tape to facilitate the deployment of communications infrastructure.[34] Administrative efficiency is a particularly important consideration in the case of AeroMACS, whose users do not regularly navigate Commission licensing databases. Moreover, AeroMACS remains an emerging technology whose uses and applications are still evolving. Thus, rules requiring the submission of duplicative information will not only raise barriers to entry, but could having a chilling effect on the continued experimentation in the development of new and innovative applications, especially if each new experimentation requires amendments to both Commission licenses and Channel Manager registrations. And, of course, this is to say nothing of the burden this proposal would impose on Commission staff.

The proposed licensing rules also are unnecessary to achieve the Commission's policy objective of quickly identifying AeroMACS users in the band to resolve interference. To ensure efficient use of the spectrum at each location, the Channel Manager must be afforded the latitude to reassign channels on an as-needed basis to reflect the geographic or time-based needs of users.[35] Thus, the Channel Manager's database – and not the Commission's Universal Licensing System – will be the best source of information regarding AeroMACS usage. In the unlikely

[34] Ajit Pai, Chairman, FCC, Remarks at The Satellite Industry Association's 21st Annual Leadership Dinner, Washington, D.C. at 2 (Mar. 12, 2018), https://docs.fcc.gov/public/attachments/DOC-349676A1.pdf; Ajit Pai, Chairman, FCC, Remarks at The National Association of Broadcasters Show, Las Vegas, NV at 2 (Apr. 25, 2017), https://docs.fcc.gov/public/attachments/DOC-344558A1.pdf.

[35] Alternatively, if the *Notice* is proposing that each license would be authorized to operate on a specific channel, this would eliminate the flexibility that a Channel Manager would have to reassign channels on an as-needed basis to reflect the geographic or time-based needs of users. Such a proposal certainly would constrain the deployment of AeroMACS, thus reducing the safety and regularity of flight benefits of this service.

event of interference, the Channel Manager would remain best situated to help resolve it. Moreover, to the extent the Commission is concerned about the speed at which such information is made available to it or other third parties, it can require the Channel Manager to make usage information available to Commission staff or other authorities in cases of interference to critical safety-related air traffic control AeroMACS applications.

In sum, the *Notice*'s proposed licensing rules would raise the barrier to entry for eligible AeroMACS users with no corresponding benefit, and thus needlessly risk constraining the deployment of AeroMACS. The Commission instead should proceed with a licensed-by-rule approach to help minimize administrative burdens on users and thus facilitate deployment of and innovation in AeroMACS.

C. Flexible Eligibility Rules Allowing AeroMACS Communications by a Range of Users – Including Airports, Airline Carriers, and Aeronautical Communications Network Providers – Will Best Promote Safety and Regularity of Flight

In its Petition, the Forum proposed that airport owners and operators, airline carriers, aeronautical communication network providers, and developmental users, among others, should all be entities eligible to register for access to AeroMACS channels so long as their communications are used exclusively for the purpose of promoting safety and regularity of flight.[36] The *Notice* proposes a far more restrictive regime, limiting eligibility for non-aircraft AeroMACS licenses to airport owners and operators and entities that have been granted permission by the airport owner or operator.[37] The Commission should pursue more flexible eligibility rules for non-Federal users of AeroMACS services.

[36] *See* Petition at 18-19.

[37] *See Notice* ¶ 38.

Flexible eligibility rules will best ensure AeroMACS delivers the public interest benefits for which it was created. For example, as previously referenced, one of the three major categories of potential AeroMACS services and applications is airline operations. AeroMACS will help airlines transfer aircraft health data to maintenance technicians and manufacturers, improve the efficiency of deicing functions, and better coordinate the movement of ground equipment and personnel.[38] Use cases such as these will help promote safety and the regularity of flight, but only if airlines have predictable access to AeroMACS networks. Similarly, extending eligibility to developmental users, such as manufacturers, will allow for ongoing product development and demonstrations, facilitating new and innovative AeroMACS applications and products.

In addition, flexible eligibility rules are consistent with the Commission's historic aversion to gatekeepers of communications networks. Indeed, the Commission repeatedly has pursued policies that prevent entities from blocking access to communications networks.[39] While the majority of airport owners and operators are likely to work cooperatively with other users of AeroMACS, even a small number of disputes could significantly dampen investment given the service's reliance on network effects. And even if such disputes do not initially arise, because airport owners and operators would have the authority to rescind permission for access to AeroMACS channels at any time, the ongoing uncertainty created by these rules could have a chilling effect on AeroMACS adoption by non-airport owners and operators.[40]

[38] Comments of Aviation Spectrum Resources, Inc., RM-11793, at 5 (filed Aug. 18, 2017).

[39] *See e.g.*, *Marriott International, Inc.*, Order, 29 FCC Rcd 11760 (EB 2014); *Continental Airlines*, Memorandum Opinion and Order, 21 FCC Rcd 13201 (2006).

[40] Specifically, non-airport entities may be reluctant to rely on AeroMACS services if faced with a perpetual risk that airport owners and operators can cut off access or impose exorbitant fees without notice.

Further, the Commission need not impose restrictive eligibility rules to provide airport owners and operators with significant control over access to AeroMACS frequencies. Airport owners and operators already control access to the airport property by third parties. Through this landlord-tenant relationship, airport owners and operators will maintain considerable control in determining the entities that can access AeroMACS channels, even under a more permissible eligibility regime.[41]

In sum, the restrictive eligibility rules proposed by the Commission potentially would preclude certain intended beneficiaries of AeroMACS networks from enjoying the benefits of this service, are contrary to the Commission's historic aversion to gatekeepers of communications networks, and could potentially dampen investment in AeroMACS system. The Commission should instead adopt a more permissive licensed-by-rule approach. Such an approach is more likely to result in robust use of AeroMACS communications for the purpose of promoting safety and regularity of flight. Moreover, because airport owners and operators control physical access to the airport property, airports will be able to protect their legitimate interests in the deployment of facilities by non-Federal AeroMACS users.

IV. THE CHANNEL MANAGER WILL HELP FACILITATE COORDINATION WITH OTHER AUTHORIZED USERS OF THE BAND

A. Utilization of the Channel Manager to Facilitate Federal/Non-Federal AeroMACS Sharing Will Maximize Efficient Use of the Spectrum, Speed Deployments, and Reduce Burdens on FAA and FCC Staff

To facilitate sharing with Federal AeroMACS users, the *Notice* proposes a two-step coordination process: (1) a requirement for non-Federal AeroMACS applicants to pre-coordinate applications with relevant FAA Regional Offices prior to the filing of an application,

[41] But, just as the Commission has made clear on numerous occasions that local governments should not be empowered to abuse their power over communications infrastructure, airports owners and operators should be similarly constrained from limiting AeroMACS use unrelated to their legitimate interests.

and (2) a requirement for Commission staff to coordinate an application a second time with the FAA prior to the grant of such application.[42] Rather than proceeding with an inefficient, lengthy, and burdensome two-step coordination process, the Forum hereby recommends a modified version of the Federal/Non-Federal sharing proposal described in its Petition. Specifically, sharing should take place between Federal and non-Federal users in accordance with a Memorandum of Agreement ("MOA") to be negotiated: 1) on behalf of Federal users by the FAA; and 2) on behalf of non-Federal users by the single, nationwide Channel Manager.[43]

The MOA approach is preferable for multiple reasons. Most notably, the MOA will maximize the flexibility afforded non-Federal and Federal interests to maximize use of the AeroMACS channels by employing whatever sharing approaches make the most sense at any given time for a particular airport. As discussed above with respect to the benefits of utilizing a Channel Manager for managing the non-Federal use of this spectrum, AeroMACS is in its nascent stages, there is much to be learned about how it can best be deployed at the nation's airports, and every effort should be made to establish a flexible regulatory regime capable of adapting as the marketplace and the technology evolves.

The MOA approach also will likely help speed deployments. The duplicative two-step coordination process proposed in the *Notice* would create unnecessary delays that likely can be avoided by the coordination process resulting from the MOA. Further delays and costs due to duplicative coordination efforts might result as AeroMACS uses evolve, and deployments are

[42] *Notice* ¶ 39.

[43] The Petition proposed that this MOA be negotiated by the National Telecommunications and Information Administration ("NTIA") on behalf of Federal users; however, given the *Notice*'s clear preference for FAA involvement in the coordination process, the Forum hereby proposes that the FAA negotiate on behalf of Federal users. In all other respect, the proposal remains the same as that described in the Petition.

amended. Such delays likely would dampen experimentation and innovation in AeroMACS applications.

Moreover, the *Notice*'s proposal would place heavy burdens on federal resources, most notably FAA staff, who would be involved in both steps of coordination, as well as Commission licensing and coordination staff, and NTIA frequency assignment staff. Alternatively, coordination resulting from the MOA likely would make greater utilization of the Channel Manager's intimate familiarity of the AeroMACS environment at each airport location, thus significantly reducing the burden on FAA, FCC, and NTIA staff.

For these reasons, the Forum respectfully urges the Commission to facilitate Federal/non-Federal AeroMACS sharing through an MOA framework.

B. AeroMACS Operations Already Are Required to Protect Satellite Systems, and the Channel Manager Will Ensure Compliance

As the *Notice* observes, AeroMACS' obligations with respect to satellite systems already are reflected in the Commission's rules. Specifically, Footnote US444B(a)(1) to the U.S. Table of Frequency Allocations directs AeroMACS operations in the 5091-5150 MHz band to operate "in accordance with Resolution 748 (Rev. WRC-12) (*i.e.*, AeroMACS)."[44] In turn, Resolution 748 (Rev. WRC-12) resolves that AeroMACS operations in this band shall meet the Standards and Recommended Practices ("SARPS") requirements published in Annex 10 of the ICAO Convention on International Civil Aviation and the requirements of Recommendation ITU-R M.1827-1 referenced in Globalstar's Reply Comments.[45] In addition, the SARPs requirements for AeroMACS were developed in part to ensure compliance with Recommendation ITU-R

[44] 47 C.F.R. § 2.106 US444B(a)(1).

[45] ITU, *Final Acts of WRC-12*, at 352-353, Resolution 748 (Rev. WRC-12) (2012).

M.1827-1, and the SARPs are the basis for the technical rules proposed in the WiMAX Forum's Petition.

The Channel Manager can help ensure compliance with these rules. Specifically, the Commission could obligate the Channel Manager to manage AeroMACS spectrum assignments to comply with its rules, which thus would include Recommendation ITU-R M.1827-1. To accomplish this, and as previously proposed by the Forum, the Commission should adopt the following rule applicable to the Channel Manager: "The AeroMACS Channel Manager will assign AeroMACS channels to eligible non-Federal entities from time to time either on an exclusive or shared basis, and manage the use of such channels, in a manner that reasonably maximizes the efficient utilization of the spectrum at each location where AeroMACS spectrum is utilized, protects the spectrum from either hoarding or warehousing, and complies with footnote US444B(a)(1) of the Table of Allocations."

C. The Channel Manager Will Facilitate Coordination with AMT, But Constraining AeroMACS to Accommodate AMT is Inconsistent with Commission's 2015 Decision to Award AeroMACS "Priority Over AMT Systems" and the Resolution 418 PFD Limits

The Channel Manager also will help to facilitate coordination with AMT users. Footnote US444B(c) to the U.S. Table of Frequency Allocations, adopted at the request of NTIA, states in relevant part that AeroMACS operators and AMT systems "are urged to cooperate" about planned deployments at those six specified airports where AMT operations occur.[46] In the interest of ensuring such cooperation, the Forum's proposed rules cite to this footnote,

[46] *See* 47 C.F.R. § 2.106 US444B(c). Footnote US444B(c) specifically urges operators of AeroMACS and AMT systems "to cooperate with each other *in the exchange of information about planned deployments of their respective systems* so that the prospects for compatible sharing of the band are enhanced…." *Id.* (emphasis added).

instructing that the "Channel Manager is urged to cooperate with [AMT] users in accordance with Table of [Frequency] Allocations footnote US444B(c)."[47]

The Channel Manager will be best situated to perform this coordination on behalf of non-Federal AeroMACS users. As the single point of contact for ensuring coordination among eligible non-Federal users of the AeroMACS band, the Channel Manager will have an unrivaled ability to provide AMT users with information related to current and planned AeroMACS deployments. This level of coordination ultimately may be sufficient to meet the needs of both services, especially at this nascent stage of AeroMACS deployments. As even Boeing recently conceded, AeroMACS and AMT operations may be able to use the same spectrum.[48]

The Commission should not, however, constrain AeroMACS deployment by delaying its implementation to accommodate AMT interests. Delaying implementation at even a small handful of airports would have negative repercussions throughout America's airports due to the importance of network effects to the AeroMACS service.[49] Indeed, even the prospect of such a delay could yield uncertainty that dampens investment in this emerging technology.

Moreover, a delay to accommodate AMT interests would be entirely inconsistent with other requirements for AeroMACS/AMT sharing as set forth in Footnote US444B, which was adopted after extensive input from Federal users of AeroMACS. Specifically, in the 2012 *WRC-07 NPRM*, the Commission sought comment on a proposal to make the 5091-5150 MHz band

[47] *See* Petition, App. A at 4-A (proposed Section 87.606(b)).

[48] Comments of the Boeing Company, ET Docket No. 12-338, at 4 (filed Feb. 25, 2013) ("Boeing Comments") ("Certain factors potentially enhance the ability for spectrum sharing between AeroMACS and AMT flight testing in the 5091-5150 MHz band.").

[49] For example, if AeroMACS deployments were delayed at an airport served by American Airlines, American Airlines may see less value in deploying AeroMACS on its planes. In turn, other airports served by American Airlines may see less value in deploying AeroMACS at their airports. In turn, airlines serving those other airports may see less value in deploying AeroMACS on their planes. Thus, in effect, delaying AeroMACS deployment even at one airport could be the equivalent of pulling the string that unravels the entire AeroMACS cloth during these nascent stages of this technology.

available for AeroMACS and AMT.[50] In response, the Aerospace and Flight Test Radio Coordination Council ("AFTRCC") and Boeing asked the Commission to require coordination of AeroMACS with AMT operations at six airports.[51]

The FAA and NTIA opposed this coordination requirement. Specifically, in its comments to the FCC, NTIA informed the FCC of its position in response to the Boeing and AFTRCC coordination proposal:

> This is a new constraint that was not considered in the International Telecommunication Union Radiocommunication (ITU-R) sector studies in preparation for WRC-07 or WRC-12. Since there is no established framework for the proposed coordination, ***AMT operations could constrain the deployment of AeroMACS at the six airports specified by AFTRCC and Boeing, which is not acceptable to the FAA***.[52]

The NTIA Priority Letter subsequently recommended the language awarding a priority for AeroMACS over AMT systems in the band.[53] In addition, NTIA recommended that AMT transmissions be limited to those from aircraft that meet internationally agreed-upon protections for AeroMACS that are set forth in ITU Resolution 418 (Rev. WRC-12).[54] The FCC subsequently codified both of these recommendations in footnote US444B.[55]

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[50] *See Amendment of Parts 1, 2, 15, 74, 78, 87, 90, and 97 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2007) (WRC-07), Other Allocation Issues, and Related Rule Updates*, Notice of Proposed Rulemaking and Order, 27 FCC Rcd 14598, 14626 ¶ 65 (2012) ("*WRC-07 NPRM*").

[51] *See* Comments of Aerospace and Flight Test Radio Coordinating Council, ET Docket No. 12-338, at 5 (filed Feb. 25, 2013); Boeing Comments at 4.

[52] *See* Letter from Paige R. Atkins, Associate Administrator, Office of Spectrum Management, NTIA, to Julius P. Knapp, Chief, Office of Engineering and Technology, FCC, ET Docket No. 12-338, at 2 (filed Feb. 11, 2015) ("NTIA Priority Letter") (attached as Appendix A) (emphasis added). Notably, the ITU-R also did not recommend imposing any of the additional coordination or coexistence requirements on AeroMACS that have been suggested by the AMT commenters. Therefore, these various suggestions effectively would result in rules governing AeroMACS operations in the U.S. that would not conform to the international recommendations.

[53] *Id.*

[54] *Id.*

[55] *FCC 2015 Actions*, 30 FCC Rcd at 4209 ¶ 59.

More recently, as the *Notice* reflects, the WiMAX Forum, FAA representatives, and members of the flight test community have held intermittent discussions over the course of the past two years regarding how to maximize use of the band without causing harmful interference to AeroMACS. Initially, at the FAA's suggestion, these conversations focused on the implementation of power control for AMT equipment operating in the band to help such operations meet the Resolution 418 power flux density limits. Thus, to the extent the Commission deems it necessary to incorporate technical parameters for aeronautical mobile telemetry in the Part 87 rules, the Forum would not object.

While the Forum continues to engage with members of the flight test community regarding an approach that would be generally applicable to all airports at which AMT operations occur, the day may ultimately come when the AMT parties and the Forum inform the Commission that they have not been able to agree on coordination criteria consistent with the internationally agreed-upon requirements contained in Resolution 418 and the FAA's insistence on an AeroMACS priority over AMT. If this occurs, the Channel Manager will be available to facilitate the cooperation encouraged in Footnote US444B. However, consistent with the Commission's previous decisions, AeroMACS implementation should not be delayed at any airports.

V. CONCLUSION

In response to increasing demand for high-bandwidth services, the momentum for AeroMACS continues to grow. As AeroMACS continues to evolve and new applications develop, the Commission should pursue a flexible, light-touch regulatory approach for this service. The use of a single, nationwide Channel Manager reflects such an approach in that it will help to maximize efficient and flexible usage of this spectrum at each airport and facilitate coordination with other authorized users of the band. To further promote AeroMACS

deployment and the resulting benefits, the Commission should authorize non-Federal AeroMACS operations as a licensed-by-rule service, adopt more permissive eligibility rules, and allow greater reliance on the Channel Manager to enable coordination with other authorized users of the band.

Respectfully submitted,

THE WIMAX FORUM

By: /s/ Sean T. Conway
Sean T. Conway, Esq.
Mark A. Settle, P.E.

Wilkinson Barker Knauer, LLP
1800 M Street, NW Suite 800N
Washington, DC 20036
202.783.4141

Counsel to The WiMAX Forum

September 3, 2019